Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
Total Program Element	110.323	141.078	106.196	-	106.196	115.779	129.588	123.288	123.359	Continuing	Continuing
624866: *Lasers & Imaging Technology*	82.876	114.343	78.211	-	78.211	82.086	83.987	83.228	85.213	Continuing	Continuing
624867: *Advanced Weapons & Survivability Technology*	27.447	26.735	27.985	-	27.985	33.693	45.601	40.060	38.146	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program covers research in directed energy (DE) technologies, primarily laser devices, optical beam control, and high power microwaves. In laser devices, this research includes moderate to high power laser devices that are applicable to a wide range of applications. In beam control, this research includes optical technologies to propagate lasers beams from a device and to provide ground-based optical space situational awareness. In high power microwaves, this research examines technologies for applications such as counter-electronics and non-lethal weapons. Vulnerability/lethality assessments are conducted for representative DE technologies. Research into other advanced non-conventional/innovative weapons will be conducted. Efforts in this program have been coordinated through the Reliance 21 process to harmonize efforts and eliminate duplication. This program is in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary technologies.

B. Program Change Summary ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Previous President's Budget	103.596	111.156	117.496	-	117.496
Current President's Budget	110.323	141.078	106.196	-	106.196
Total Adjustments	6.727	29.922	-11.300	-	-11.300
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-0.078			
• Congressional Rescissions	-	-			
• Congressional Adds	-	30.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	2.404	-			
• SBIR/STTR Transfer	-5.852	-			
• Other Adjustments	10.175	-	-11.300	-	-11.300

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2011	FY 2012
Project: 624866: *Lasers & Imaging Technology*		
Congressional Add: *Ground Optical Imaging Research and Technology.*	11.143	-
Congressional Add: *Space Situational Awareness.*	-	30.000

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Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2011	FY 2012
Congressional Add Subtotals for Project: 624866	11.143	30.000
Congressional Add Totals for all Projects	11.143	30.000

Change Summary Explanation

FY11: Other Adjustments include -1.025 Congressional General Reductions and 11.2 Congressional Adds

Decrease in FY13 is due to higher Department of Defense priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 624866: *Lasers & Imaging Technology*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
624866: *Lasers & Imaging Technology*	82.876	114.343	78.211	-	78.211	82.086	83.987	83.228	85.213	Continuing	Continuing

Note

Note: In FY 2011, $7.6 million was transferred from the $18.8 million Congressional re-alignment of funding for ground optical imaging research and technology for ground optical imaging research and technology in this project to PE 0603444F to better carry out the intention of Congress.

A. Mission Description and Budget Item Justification

This project explores the technical feasibility of moderate to high power lasers, including beam control, for applications such as aircraft protection, force protection, and precision engagement. This project investigates the effects of laser weapons. Research in ground-based optical space situational awareness is conducted.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1.	33.706	37.692	30.879	-	30.879
Description: Develop high energy laser device technologies for Air Force applications.					
FY 2011 Accomplishments: Tested laser components and subsystems incorporating advances for thermal management. Ruggedized laser sources for aircraft self-protection and improved system packaging. Demonstrated operation of a flowing diode-pumped alkaline laser. Conducted damage/vulnerability tests against real and simulated systems.					
FY 2012 Plans: Conduct research supporting design and fabrication of weapons-class laser components, including hybrid and fiber lasers, for potential inclusion on an aircraft. Develop, design, and test selected components and subsystems for an electric laser weapon demonstrator on a large aircraft. Develop advanced electrically-powered laser concepts.					
FY 2013 Base Plans: Conduct research supporting design and fabrication of weapons-class laser components, including hybrid and fiber lasers, for potential inclusion on an aircraft. Begin design and testing of selected components and subsystems for an electric laser weapon demonstrator on a large aircraft. Continue development of advanced electrically-powered laser concepts.					
FY 2013 OCO Plans:					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
N/A					
Title: Major Thrust 2. ***Description:*** Develop and demonstrate optical laser beam control technologies including atmospheric compensation and pointing and tracking. Demonstrate the integration of optical beam control technologies with laser device technologies. ***FY 2011 Accomplishments:*** Upgraded horizontal propagation compensation concepts for field demonstrations. Conducted tactical relay mirror demonstrations at low power. Conducted spin-off laser communications research focused on ultra-high data rate, free-space, secure communications including atmospheric signal degradation. ***FY 2012 Plans:*** Conduct laboratory testing on horizontal propagation compensation concepts and begin planning for field testing. Complete tactical relay mirror demonstrations at low and high power. Prepare to demonstrate a high power solid state laser with a beam control system on the ground. ***FY 2013 Base Plans:*** Demonstrate technologies supporting force protection. Evaluate and integrate horizontal propagation compensation concepts for field testing. Demonstrate a high power solid state laser with a beam control system on the ground. ***FY 2013 OCO Plans:*** N/A	13.095	16.919	17.418	-	17.418
Title: Major Thrust 3. ***Description:*** Develop advanced, long-range, optical technologies that support ground-based optical space situational awareness. ***FY 2011 Accomplishments:*** Assessed capabilities of second-generation sodium beacon adaptive optics system on 3.5 meter telescope at visible and near-infrared wavelengths. Developed and refined technologies to advance space situational awareness. ***FY 2012 Plans:*** Conduct research, including data analysis, and demonstrate compensated	24.932	29.732	29.914	-	29.914

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
imaging and detection of very dim objects at visible and near-infrared wavelengths using advanced adaptive optics systems at Starfire Optical Range and Maui Space Surveillance Systems sites. Integrate and test technologies to advance ground-based optical space situational awareness. ***FY 2013 Base Plans:*** Conduct research, including data analysis, and demonstrate active and compensated imaging and detection of very dim objects at visible and near-infrared wavelengths using advanced adaptive optics systems at Starfire Optical Range and Maui Space Surveillance Systems sites. Integrate and test technologies to advance ground-based optical space situational awareness. Develop initial capabilities for extending existing techniques into 24-hour operations, including covering geosynchronous orbits. ***FY 2013 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	71.733	84.343	78.211	-	78.211

	FY 2011	FY 2012
Congressional Add: Ground Optical Imaging Research and Technology. ***FY 2011 Accomplishments:*** Conducted Congressionally-directed effort. ***FY 2012 Plans:*** N/A	11.143	-
Congressional Add: Space Situational Awareness. ***FY 2011 Accomplishments:*** N/A ***FY 2012 Plans:*** Conduct Congressionally-directed effort.	-	30.000
Congressional Adds Subtotals	11.143	30.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

N/A

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APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 624866: *Lasers & Imaging Technology*

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 624867: *Advanced Weapons & Survivability Technology*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
624867: *Advanced Weapons & Survivability Technology*	27.447	26.735	27.985	-	27.985	33.693	45.601	40.060	38.146	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project explores high power microwave (HPM) and other non-conventional/innovative weapon concepts to support applications such as non-lethal counter-personnel and disruption, degradation, and damage of electronic infrastructure. This research will allow most effects to be covert with no collateral structural or human damage. This project also investigates the effects of potential HPM weapons and mitigation of HPM effects.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1.	20.019	19.922	20.375	-	20.375
Description: Investigate technologies for HPM components. Investigate HPM and other unconventional weapon concepts using innovative technologies. Investigate advanced technologies that support force protection tactical applications, including non-lethal counter-personnel applications. ***FY 2011 Accomplishments:*** Refined HPM devices and antennas to reduce size/increase effectiveness. Investigated state-of-the-art energy storage components. Investigated technologies of key Active Denial components for airborne applications. Performed full-powered, long-pulse, high duty-cycle testing of the 2.5 megawatt gyrotron source. Investigated alternative use applications for Active Denial technologies. ***FY 2012 Plans:*** Investigate technologies to enhance standoff capabilities of HPM components used for electronic attack. Conduct high energy density plasma experiments. ***FY 2013 Base Plans:*** Investigate technologies to provide frequency agile, broadband sources. Investigate state-of-the-art components to shrink antennas, microwave components, and energy storage/prime power technologies. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 2.	7.428	6.813	7.610	-	7.610

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Description: Assess the effects/lethality of HPM technologies. Develop and apply sophisticated models to enhance the development of HPM and related technology. Investigate technologies to counter the effects of HPM. ***FY 2011 Accomplishments:*** Applied advances in target effect prediction to a suite of HPM-related codes. Demonstrated mitigation efforts applicable to Air Force and other U.S. government systems. Refined models for use in HPM system development. ***FY 2012 Plans:*** Investigate mitigation effects of HPM on U.S. systems of interest including modern tactical aircraft components. Update models based on latest experimental HPM data. ***FY 2013 Base Plans:*** Investigate effects of high bandwidth technologies, exploring issues to exploit/prevent cyber attack. Begin consideration of smart waveform technologies and techniques. ***FY 2013 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	27.447	26.735	27.985	-	27.985

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.